

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS

PATENT OF THE UNITED STATES IS:

1. An external additive for a toner, having an  
5 average primary particle diameter not greater than 100 nm  
and comprising:

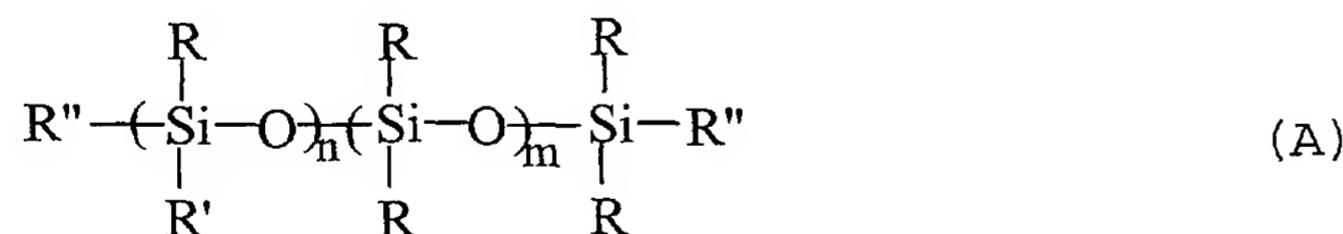
inorganic fine particles; and  
a hydrophobizing agent applied to the surface of the  
inorganic fine particles,

10 wherein after the external additive is treated with  
chloroform, pyrolysates of the residual components include  
a compound having at least one structure selected from the  
group consisting of organopolysiloxane structures and ring  
siloxane structures.

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2. The external additive of Claim 1, wherein the  
pyrolysates of the residual components include the compound  
having the organopolysiloxane structure, and wherein the  
organopolysiloxane structure has the following formula (A) :

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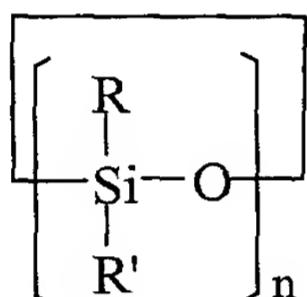


wherein R represents an alkyl group having from 1 to 3  
25 carbon atoms; R' represents a silicone oil modification  
group; R'' represents an alkyl group having from 1 to 3  
carbon atoms or an alkoxy group; and n and m are

independently an integer and satisfy the following relationship:

$$1 \leq (n + m).$$

5        3. The external additive of Claim 1, wherein the pyrolysates of the residual components include the compound having the ring siloxane structure, and wherein the ring siloxane structure has the following formula (B) :



(B)

10        wherein R represents an alkyl group having from 1 to 3 carbon atoms; R' represents a silicone oil modification group modified by an alkyl group, a halogen modified alkyl group, a phenyl group or a modified phenyl group; and n is an integer not less than 3.

15        4. The external additive of Claim 3, wherein n is an integer not less than 4.

20        5. The external additive of Claim 1, wherein the hydrophobizing agent is a silicone oil.

25        6. The external additive of Claim 5, wherein the silicone oil is applied to the surface of the inorganic fine particles upon application of heat.

7. The external additive of Claim 1, wherein the inorganic fine particles are selected from the group consisting of silica, titanium oxide and alumina.

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8. A method for preparing an external additive for an electrophotographic toner, comprising:

coating inorganic fine particles with a hydrophobizing agent; and

heating the inorganic fine particles to form the external additive,

wherein after the external additive is treated with chloroform, pyrolysates of the residual components include a compound having at least one structure selected from the group consisting of organopolysiloxane structures and ring siloxane structures.

9. The method of Claim 8, wherein the coating is performed while the heating is performed.

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10. The method of Claim 8, wherein the coating is performed after the heating is performed.

11. A toner comprising:

a binder resin;

a colorant; and

a first external additive,

wherein the toner has a volume average particle diameter not greater than 15  $\mu\text{m}$ , and

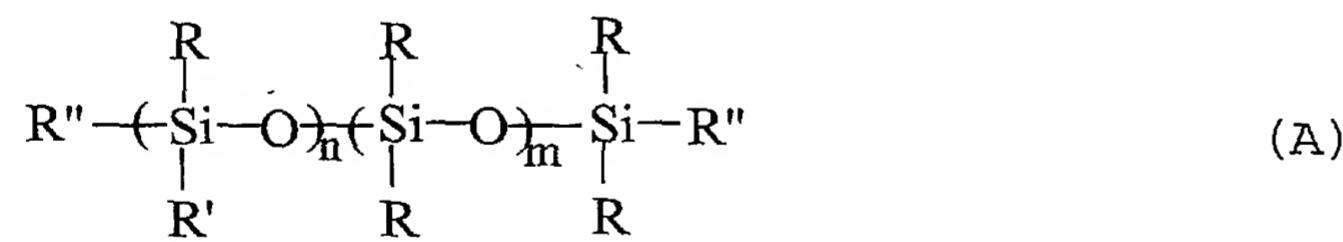
wherein the first external additive has an average primary particle diameter not greater than 100 nm and  
5 comprises:

inorganic fine particles; and

a hydrophobizing agent applied to the surface of the inorganic fine particles,

wherein after the external additive is treated with  
10 chloroform, pyrolysates of the residual components include a compound having at least one structure selected from the group consisting of organopolysiloxane structures and ring siloxane structures.

15 12. The toner of Claim 11, wherein the organopolysiloxane structure has the following formula (A) :

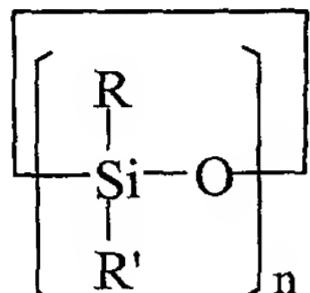


20 wherein R represents an alkyl group having from 1 to 3 carbon atoms; R' represents a silicone oil modification group; R'' represents an alkyl group having from 1 to 3 carbon atoms or an alkoxy group; and n and m are independently an integer and satisfy the following relationship:

$$1 \leq (n + m).$$

13. The toner of Claim 11, wherein the ring siloxane structure has the following formula (B):

5



(B)

wherein R represents an alkyl group having from 1 to 3 carbon atoms; R' represents a silicone oil modification group modified by an alkyl group, a halogen modified alkyl group, a phenyl group or a modified phenyl group; and n is an integer not less than 3.

14. The toner of Claim 13, wherein n is an integer

15 not less than 4.

16. The toner of Claim 11, wherein the hydrophobizing agent is a silicone oil.

20 16. The toner of Claim 15, wherein the silicone oil is applied to the surface of the inorganic fine particles upon application of heat.

25 17. The toner of Claim 11, wherein the inorganic fine particles are selected from the group consisting of silica, titanium oxide and alumina.

18. The toner of Claim 11, further comprising a second external additive having an average primary particle diameter less than the average primary particle diameter of the first external additive.

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19. The toner of Claim 11, further comprising a third external additive comprising fine particles of a resin, wherein the fine particles of the resin has an average particle diameter greater than the average particle diameter of the first external additive.

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20. The toner of Claim 18, further comprising a third external additive comprising fine particles of a resin, wherein the fine particles of the resin has a larger average particle diameter than the average particle diameter of the first external additive.

15

21. An image forming apparatus comprising:

20 at least one image-bearing member configured to bear an electrostatic latent image;

an image developer comprising at least one developing section configured to develop the electrostatic latent image with a developer comprising a toner to form a toner image on the image-bearing member; and

25 an image transferer configured to transfer the toner image onto a receiving material,

wherein the toner comprises:

a binder resin;  
a colorant; and  
a first external additive,

wherein the first external additive comprises:

5 an inorganic particulate material; and  
a hydrophobizing agent applied to the surface of the  
inorganic fine particles,

wherein after the external additive is treated with  
chloroform, pyrolysates of the residual components include  
10 a compound having at least one structure selected from the  
group consisting of organopolysiloxane structures and ring  
siloxane structures.

22. The image forming apparatus of Claim 21, wherein  
15 the developer is a two-component developer comprising a  
magnetic carrier and the toner.

23. The image forming apparatus of Claim 21, wherein  
the image developer includes plural developing portions,  
20 wherein each of the plural developing portions is  
configured to develop plural electrostatic latent images on  
the image bearer with a different color developer to form a  
different color toner image on the image bearer, and  
wherein the image transferer transfers the plural color  
25 toner images onto the receiving material one by one to form  
a full color image on the receiving material.

24. The image forming apparatus of Claim 23, wherein each of the plural developing portions comprises:

a developing roller configured to bear a layer of the developer thereon; and

5 a blade configured to form the layer of the developer on the developing roller.

25. The image forming apparatus of Claim 21, including the intermediate transfer medium and the image developer including plural developing portions, wherein each of the plural developing portions is configured to develop the electrostatic latent image with a different color developer to form a different color toner image on the image bearer, and

15 wherein the image transferer further comprises:

a first transfer member configured to transfer the different color toner images on the image-bearing members to the intermediate transfer medium while the first transfer member contacts the intermediate transfer medium and the intermediate transfer medium contacts the image-bearing member, to form a full color image on the intermediate transfer medium; and

20 a second transfer member configured to transfer the full color image on the intermediate transfer medium to the receiving material while the second transfer member contacts the intermediate transfer medium and the intermediate transfer medium contacts the receiving

material.

26. The image forming apparatus of Claim 21, wherein  
the image transferer further comprises:

5           a transfer member configured to transfer the toner  
image on the image bearer onto the receiving material while  
the transfer member contacts the receiving material and the  
receiving material contacts the image bearer.

10          27. The image forming apparatus of Claim 21,  
including plural image bearers and the intermediate  
transfer medium, and the image developer including plural  
developing portions, wherein each of the plural developing  
portions is configured to develop the electrostatic latent  
15        image with a different color developer to form a different  
color toner image on the respective image bearer, and  
wherein the image transferer further comprises:

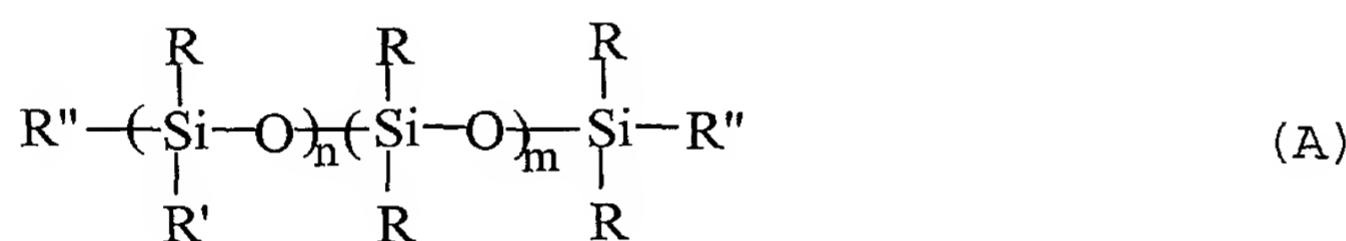
20           a first transfer member configured to transfer the  
different color toner images on the plural image bearers  
onto the intermediate transfer medium while the first  
transfer member contacts the intermediate transfer medium  
and the intermediate transfer medium contacts the plural  
image bearers, to form a full color image on the  
intermediate transfer medium; and

25           a second transfer member configured to transfer the  
full color image onto the intermediate transfer medium to  
the receiving material while the second transfer member

contacts the intermediate transfer medium and the intermediate transfer medium contacts the receiving material.

5        28. The image forming apparatus of Claim 21, further comprising a mechanism, wherein the receiving material drives the image bearer while contacting thereto.

10      29. The image forming apparatus of Claim 21, wherein the organopolysiloxane structure has the following formula (A) :



15      wherein R represents an alkyl group having from 1 to 3 carbon atoms; R' represents a silicone oil modification group; R'' represents an alkyl group having from 1 to 3 carbon atoms or an alkoxy group; and n and m are independently an integer and satisfy the following relationship:

$$1 \leq (n + m).$$

20      30. The image forming apparatus of Claim 21, wherein the ring siloxane structure has the following formula (B) :



wherein R represents an alkyl group having from 1 to 3 carbon atoms; R' represents a silicone oil modification group modified by an alkyl group, a halogen modified alkyl group, a phenyl group or a modified phenyl group; and n is 5 an integer not less than 3.

31. The image forming apparatus of Claim 30, wherein n is an integer not less than 4.

32. The image forming apparatus of Claim 21, wherein the hydrophobizing agent is a silicone oil.

33. The image forming apparatus of Claim 21, wherein 15 the silicone oil is applied to the surface of the inorganic fine particles upon application of heat.

34. The image forming apparatus of Claim 21, wherein 20 the inorganic fine particles are selected from the group consisting of silica, titanium oxide and alumina.

35. The image forming apparatus of Claim 21, further comprising a second external additive having an average primary particle diameter less than the average primary 25 particle diameter of the inorganic fine particles.

36. The image forming apparatus of Claim 32, further

comprising a third external additive comprising fine particles of a resin, wherein the fine particles of the resin have an average particle diameter greater than the average primary particle diameter of the inorganic fine  
5 particles.

37. The image forming apparatus of Claim 21, further comprising a third external additive comprising fine particles of a resin, wherein the fine particles of the resin have an average particle diameter greater than the average primary particle diameter of the inorganic fine  
10 particles.

38. The image forming apparatus of Claim 21, wherein  
15 said image transferer is configured to transfer the toner image onto the receiving material via an intermediate transfer medium.